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ABSTRACT

The United States Training and Employment Service General Aptitude Test Battery (GATB), first published in 1947, has been included in a continuing program of research to validate the tests against success in many different occupations. The GATB consists of 12 tests which measure nine aptitudes: General Learning Ability; Verbal Aptitude; Numerical Aptitude; Spatial Aptitude; Form Perception; Clerical Perception; Motor Coordination; Finger Dexterity; and Manual Dexterity. The aptitude scores are standard scores with 100 as the average for the general working population, and a standard deviation of 20. Occupational norms are established in terms of minimum qualifying scores for each of the significant aptitude measures which, when combined, predict job performance. Cutting scores are set only for those aptitudes which aid in predicting the performance of the job duties of the experimental sample. The GATB norms described are appropriate only for jobs with content similar to that shown in the job description presented in this report. A description of the validation sample is also included. (AG)

ED 062406

TECHNICAL REPORT

ON

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY

FOR

SOLDERER I (any ind.) 6-95.001

B-406 or S-142

U. S. Employment Service in
Cooperation with
Pennsylvania State Employment Service

TM 001 524

U. S. DEPARTMENT OF LABOR
Bureau of Employment Security
Washington 25, D. C.
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May 1957

STANDARDIZATION OF THE GENERAL APTITUDE TEST BATTERY FOR SOLDERER I 6-95.001

B-406 or S-142

Summary

The General Aptitude Test Battery, B-1002A, was administered to a sample of 43 men and 7 women employed as Solderer I 6-95.001 by the Superior Meter Company, Punxsutawney, Pennsylvania. The criterion consisted of rank order supervisory ratings. On the basis of mean scores, standard deviations, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes P-Form Perception, F-Finger Dexterity, and M-Manual Dexterity were selected for inclusion in the test norms.

GATB Norms for Solderer I 6-95.001 - B-406 or S-142

Table I shows, for B-1001 and B-1002, the minimum acceptable score for each aptitude included in the test norms for Solderer I 6-95.001

TABLE I

Minimum Acceptable Scores on B-1001 and B-1002 for B-406 or S-142

B-1001			B-1002		
Aptitude	Tests	Minimum Acceptable Aptitude Score	Aptitude	Tests	Minimum Acceptable Aptitude Score
P	CB-1-A CB-1-L	90	P	Part 5 Part 7	90
F	CB-1-O CB-1-P	90	F	Part 11 Part 12	85
M	CB-1-M CB-1-N	90	M	Part 9 Part 10	85

Effectiveness of Norms

The data in Table IV indicate that 11 of the 17 poor workers, or 65 percent of them, did not achieve the minimum scores established as cutting scores on the recommended test norms. This shows that 65 percent of the poor workers would not have been hired if the recommended test norms had been used in the selection process. Moreover, 30 of the 36 workers who made qualifying test scores, or 83 percent, were good workers.

TECHNICAL REPORT

I. Problem

This study was conducted to determine the best combination of aptitudes and minimum scores to be used as norms on the General Aptitude Test Battery for the occupation of Solderer I 6-95.001.

II. Sample

The GATB, B-1002A, was administered May 17, 20, and 21, 1957, to a sample of 43 men and 7 women employed as Solderer I 6-95.001 by the Superior Meter Company, Punxsutawney, Pennsylvania.

On-the-job training, which takes approximately 12 weeks, is given by the line supervisor. The company prefers applicants who are high school graduates but will accept those with an eighth grade education. Experience is not necessary since on-the-job training is given. Workers should be at least 5 feet in height and not over 200 pounds in weight since they must stand at a work station and work at a sustained pace all day. Expert solderers are usually promoted to inspection jobs in the proving room.

New workers are referred by the State Employment Service or hired at the gate. Upon completion of the company application, the applicant's stability, health, interest, and attitude are subjectively measured when he is interviewed by the Plant Manager.

Table II shows the means, standard deviations, ranges, and Pearson product-moment correlations with the criterion for age, education, and experience.

TABLE II

Means (M), Standard Deviations (σ), Ranges, and
Pearson Product-Moment Correlations with the Criterion (r)
for Age, Education, and Experience

Solderer I 6-95.001
N = 50

	M	σ	Range	r
Age (years)	25.0	6.6	19-52	-.010
Education (years)	11.5	1.1	8-12	.145
Experience (months)	10.5	2.8	6-16	.121

There are no significant correlations with the criterion for age, education, or experience. The data in Table II indicate that this sample is suitable for test development purposes with respect to age, education, and experience.

III. Job Description

Job Title: Solderer I 6-95.001

Job Summary: Works on an assembly line as one of a crew performing a variety of assembly and soldering operations in the manufacture of tin case gas meters.

Work Performed: Obtains assembly parts from bins and places items to right of work station.

Prepares equipment and supplies: Lights furnace and places pointed and box irons in furnace to heat to the correct working temperature. Secures proper jig on work table. Checks supply of paste, solder, and other materials.

Assembles and solders sub units into proper position: Picks up and positions packing boxes and carriage bearing into receptacle on jig. Picks up table with both hands and places table in proper position over bearing and packing boxes. Grasps clamp with left hand, pulls down tight with right hand and fastens clamp on bottom of jig to hold assembly firmly in position. Picks up paste brush with right hand; daubs bearing and packing box areas with paste. Picks up pointed iron in right hand; cleans solder iron by thrusting iron into wet tank momentarily or by rubbing hot iron on sal ammoniac block as required. Places irons into furnace to attain proper heating point. Picks up solder stick with left hand and hot pointed iron with right hand and positions hot iron on bearing, simultaneously touching solder stick to hot iron which causes molten solder to run over bearing edge. Replaces pointed iron in furnace and picks up hot box iron; cleans iron. Positions box over upper packing box with left hand, touches hot iron with soldering stick which causes solder to flow down over packing box and table thus firmly soldering the packing box into the table. Smooths and seals solder around packing box by twirling iron one full turn and back over soldered joint. Replaces box iron in furnace; unclamps table by releasing lever of jig; wipes excess paste from bearing and packing boxes; removes unit from jig.

Performs other assembly and soldering operations.

IV. Experimental Battery

All the tests of the GATB, B-1002A, were administered to the sample group.

V. Criterion

The criterion consisted of rank order ratings (converted to linear scores) made by the supervisor of the assembly line. The ratings were made August 30, 1957. It was not possible to secure another rating for the workers because of a change in company personnel. The supervisor was not available for reratings and his successor felt that his knowledge of the job proficiency of each worker was too limited for him to rate workers in the sample.

VI. Statistical and Qualitative Analyses

A. Statistical Analysis:

Table III shows the means, standard deviations, and Pearson product-moment correlations with the criterion for the aptitudes of the GATB. The means and standard deviations of the aptitudes are comparable to general working population norms with a mean of 100 and a standard deviation of 20.

TABLE III

Means (M), Standard Deviations (σ), and Pearson Product-Moment Correlations with the Criterion (r) for the Aptitudes of the GATB

Solderer I 6-95.001
N = 50

Aptitudes	M	σ	r
G-Intelligence	99.8	14.3	.157
V-Verbal Aptitude	94.1	12.2	.079
N-Numerical Aptitude	103.7	14.9	.295*
S-Spatial Aptitude	100.5	18.7	.082
P-Form Perception	102.8	17.3	.299*
Q-Clerical Perception	101.6	12.8	.258
K-Motor Coordination	105.0	15.1	.183
F-Finger Dexterity	101.9	15.5	.285*
M-Manual Dexterity	112.5#	19.2	.435**

**Significant at the .01 level
*Significant at the .05 level
#Highest mean score

B. Qualitative Analysis:

The statistical results were interpreted in the light of the job analysis data. The job analysis indicated that the following aptitudes measured by the GATB appear to be important for this occupation:

Form Perception (P) - required in fitting, aligning, and positioning component parts, simultaneously making visual inspection to determine proper alignment; also required in observing completeness of weld for absence of air holes, pockets, and other defects in weld of seams.

Finger Dexterity (F) and Manual Dexterity (M) - required in picking up, grasping, positioning, fitting, aligning, and assembling component parts of tin case gas meters.

C. Selection of Test Norms:

Based on the quantitative and qualitative evidence cited above, Aptitudes P, F, and M warranted further consideration for inclusion in the test norms. The evidence for each of these aptitudes is indicated below.

Aptitude	High Mean Score	Significant Correlation with the Criterion	Importance Indicated by Qualitative Analysis
P		X	X
F		X	X
M	X	X	X

Although Aptitude N showed significant correlation with the criterion, it was not considered further for inclusion in the norms because there was no other qualitative or quantitative evidence of significance.

Various combinations of Aptitudes P, F, and M, with appropriate cutting scores were selected as trial norms. The relationship between each set of trial norms and the criterion (dichotomized as indicated in Section VII) was determined.

A comparison of the results showed that norms consisting of P-90, F-85, and M-85 for B-1002 and equivalent norms of P-90, F-90, and M-90 for B-1001 had the best selective efficiency.

In test development studies an attempt is made to develop a set of norms such that the cutting score for each aptitude included in the norms will be set at a five-point score level close to one standard deviation below the aptitude mean of the experimental sample. Adjustments of cutting scores from one standard deviation below the mean are made to effect better selective efficiency of the norms. In this study the aptitude cutting scores are each within 10 points of one standard deviation below the aptitude mean of the sample.

Concurrent Validity of Norms

For the purpose of computing the tetrachoric correlation coefficient between the test norms and the criterion and applying the Chi Square test, the criterion was dichotomized by placing approximately one-third of the sample in the low criterion group. Those workers who received a linear score of 42 or more were placed in the high criterion group; those workers who received a linear score of 41 or less were placed in the low criterion group. This resulted in 17 of the 50 workers, or 34 percent of the sample, being placed in the low criterion group.

Table IV shows the relationship between test norms consisting of Aptitudes P, F, and M with critical scores of 90, 85, and 85 respectively, and the dichotomized criterion for Solderer I 6-95.001. Workers in the high criterion group have been designated as "good workers," and those in the low criterion group as "poor workers."

TABLE IV

Relationship between Test Norms Consisting of Aptitudes P, F, and M with Critical Scores of 90, 85, and 85 Respectively, and the Criterion for Solderer I 6-95.001

N = 50

	Non-Qualifying Test Scores	Qualifying Test Scores	Total
Good Workers	3	30	33
Poor Workers	11	6	17
Total	14	36	50

r_{tet} = .83 X^2 = 14.566

σr_{tet} = .24 P/2 < .0005

The data in the above table indicate a significant relationship between the test norms and the criterion for the sample.

VIII. Conclusions

On the basis of mean scores, correlations with the criterion, job analysis data, and their combined selective efficiency, Aptitudes P, F, and M with minimum scores of 90, 85, and 85 respectively, are recommended as B-1002 norms for the occupation of Solderer I 6-95.001. The equivalent B-1001 norms consist of P-90, F-90, and M-90.

IX. Determination of Occupational Aptitude Pattern

When the specific test norms for an occupation include three aptitudes, only those occupational aptitude patterns which include the same three aptitudes with cutting scores that are within 10 points of the cutting scores established for the specific norms are considered for that occupation. None of the existing 23 occupational aptitude patterns meet these requirements for this study. Therefore, none of the existing occupational aptitude patterns is recommended for the occupation covered by this study. However, the data for this sample will be considered for future groupings of occupations in the development of new occupational aptitude patterns.